Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**A Brief History of the Periodic Table: Digital Edition**



**Video #1:** <https://www.youtube.com/watch?v=3yzMsnhVuNE>

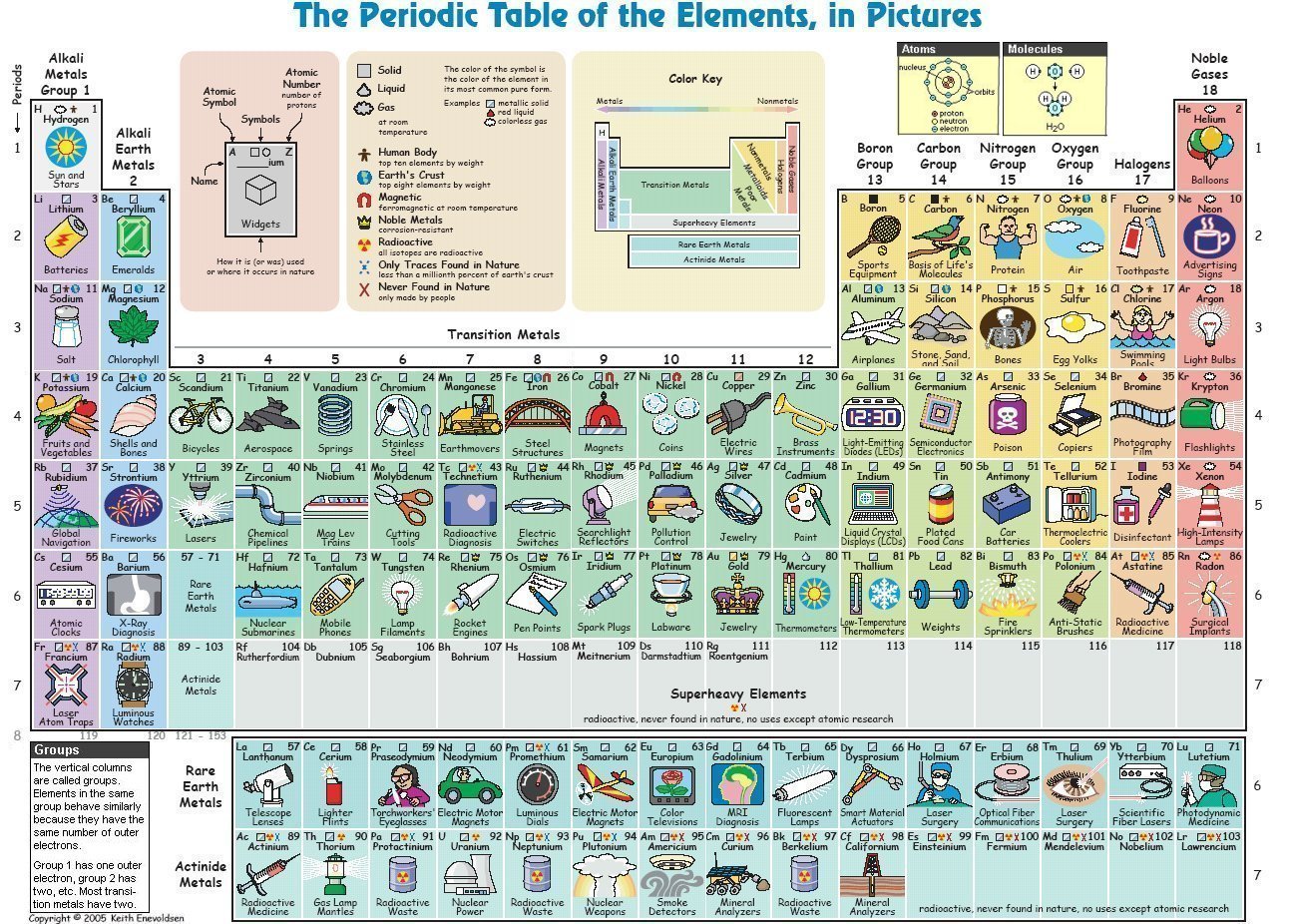
<https://www.youtube.com/watch?v=oSBM2SXlGCk>

1. When did Mendeleev create the periodic table? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What country was Mendeleev from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How many elements had been discovered at that time? \_\_\_\_\_\_\_\_\_
4. What did Mendeleev write on each element’s index card?
5. How many groups did Mendeleev divide the elements into? \_\_\_\_\_\_\_\_\_\_
6. What did the elements in each group have in common?
7. Mendeleev used his periodic table to predict the existence and properties of Scandium, Gallium, and Germanium. Which elements were these based on?
8. Why is the periodic table of elements significant?
9. Which element is named after Mendeleev? List the name and atomic number.

**Video #2:** [**http://www.youtube.com/watch?v=-wu0LixSBpk**](http://www.youtube.com/watch?v=-wu0LixSBpk)

1. What does Hank compare the periodic table of elements to?
2. What property did Mendeleev originally use to sort the elements?
3. What pattern did Mendeleev discover when he first sorted the elements?
4. Why did Mendeleev leave some spaces blank? Explain the HORIZONTAL and VERTICAL patterns.
5. Is the periodic table cooler than the alphabet?!?!!!! \_\_\_\_\_\_\_\_\_\_\_\_\_\_

(there is only one right answer)



***A Brief History of the Periodic Table***

## Organizing the elements

On a clear evening, you can see one of the various phases of the Moon. Each month, the Moon seems to grow larger, then smaller, in a repeating pattern. This type of change is periodic. **Periodic** means “**repeated in a pattern**.” Look at a calendar. The days of the week are periodic because they repeat themselves every seven days. Months repeat every 12 months. The calendar is a periodic table of days and months. Calendars are used to organize your schedule into a convenient format.

In the late 1800s, **Dmitri Mendeleev**, a Russian chemist, searched for a way to organize the elements. When he arranged all the elements known at that time in order of increasing *atomic mass*, he discovered a pattern. Chemical properties found in lighter elements could be shown to repeat in heavier elements. Because the pattern repeated, it was considered periodic. Today, this arrangement is called a **periodic table of elements**. In the periodic table, the elements are arranged by increasing atomic number and by changes in physical and chemical properties.

To begin his task, Mendeleev wrote facts about the elements on individual paper cards. On these cards, Mendeleev wrote information such as the elements' melting points, densities, colors, atomic mass (the average mass of one atom of that element), and bonding powers (the number of chemical bonds an element can form).

Once Mendeleev's cards were made, he tried arranging them in various ways. Finally, Mendeleev noticed that patterns appeared when the elements were arranged in order of increasing atomic mass. One of the trends that he noticed showed that the bonding power of the elements from lithium to fluorine change in an orderly way. For example, after fluorine, the next heaviest element Mendeleev knew was sodium, which has the same bonding power as lithium. Using this knowledge, Mendeleev placed the card for sodium below the card for lithium. This worked well -- as he laid out cards, each element had properties similar to the elements above and below it.

Mendeleev's table was not perfect, however. Arranging the elements by increasing atomic mass left three blank spaces in the table. Despite this development, however, Mendeleev boldly proposed that these blank spaces would be filled by elements that had not yet been discovered. Mendeleev was even able to use the patterns in his table to predict the properties of these undiscovered elements. This first periodic table of the elements was published in 1869.

The word "periodic" means that there is a repeating pattern -- that is, the properties of the elements repeat with each row -- or period -- of the table. Amazingly, within 16 years of Mendeleev's first periodic table, chemists had discovered all three of the missing elements (scandium, gallium, and germanium), and their properties were very close to what Mendeleev had predicted.

## Improving the Periodic Table

Although Mendeleev’s arrangement of elements was successful, it did need some changes. On Mendeleev’s table, the atomic mass gradually increased from left to right. If you look at the modern periodic table, you will see several examples such as cobalt and nickel, where the mass decreases from left to right. You also might notice that the atomic number always increases from left to right. In 1913, the work of **Henry G. J. Moseley**, a young English scientist, led to the arrangement of elements based on their increasing **atomic numbers** instead of an arrangement based on atomic masses. He modified the 'Periodic Law' to read that the properties of the elements vary periodically with their atomic numbers. Moseley's modified Periodic Law puts the elements tellurium and iodine in the right order, as it does for argon and potassium, cobalt and nickel. This new arrangement seemed to correct the problems that had occurred in the old table. The current periodic table uses Moseley’s arrangement of the elements.

## Adding to the Periodic Table

Although Mendeleev had predicted the existence of 3 missing elements, there were many more elements he had not yet discovered. In 1894, scientist **William Ramsay** removed oxygen, nitrogen, water and carbon dioxide from a sample of air and was left with a gas 19 times heavier than hydrogen, very unreactive and with an unknown emission spectrum. He called this gas Argon. In 1895 he discovered helium as a decay product of uranium and matched it to the emission spectrum of an unknown element in the sun that was discovered in 1868. (Helios is the Greek for Sun). He went on to discover neon, krypton and xenon, and realized these represented a new group in the Periodic Table. Many years later, in 1940, **Glenn Seaborg** synthesized transuranic elements (the elements after uranium in the periodic table). In 1940 uranium was bombarded with neutrons in a cyclotron to produced Neptunium (Z=93). Plutonium (Z=94) was produced from uranium and deuterium. The discovery of these two new elements allowed for the development of the atomic bomb. These new elements were part of a new block of the Periodic table called Actinides.

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*Reading Questions (complete sentences not required)*

1. Give an example of something “periodic” (no, the examples in the text do not count)
2. How did Mendeleev write down the information on each element?
3. What did Moseley change about Mendeleev’s periodic table?
4. What group of elements did Ramsay discover?
5. Which of these four scientists has an element named after him? (There may be more than one). List each element, its symbol, its atomic number and atomic mass.
6. Create a table that lists the year, the scientist, and his contribution to the periodic table.